Project Report

on

Intelligent Customer Help Desk with Smart Document Understanding

by

Ketki Nirantar

Intelligent Customer Help Desk with Smart Document Understanding

1. INTRODUCTION : -

1.1 OVERVIEW:

We will build a chatbot using various Watson AI Services(Watson Assistant, Watson Discovery, Watson Cloud Function and Node-Red) to deliver an effective Web based UI through which we can chat with the assistant.
We will integrate Watson Discovery Service with Watson Assistant using webhooks.

1. Project Requirements: Node-Red, IBM Cloud Services, IBM Watson, Node JS
2. Functional Requirements: IBM Cloud Service Platform
3. Technical Requirements: AI, ML, Watson AI, Node JS
4. Software Requirements: Watson Assistant, Watson Discovery, Watson Cloud Function, Node-Red
5. Project Deliverables: Intelligent Customer Help Desk with Smart Document Understanding
6. Project Duration: 30 Days

1.2 PURPOSE:

SDU(Smart Document Understanding) trains Watson Discovery to extract custom fields in your documents. Customizing how out documents are indexed into Discovery will improve the answers returned from queries. With SDU, we annotate fields within our documents to train custom conversion models. As we annotate, Watson is learning and will start predicting annotations. SDU models can a lso be exported and used on other collections.

In this project, there will be another option. If the Customer Question is about the operation of a device, the application shall pass the question onto Watson Discovery Service, which has been per-loaded with the device's owner's manual. So now, instead of "Would you like to speak to a customer representative?" we can return relevant sections of the owner's manual to help solve our customers' problems. To take it a step further, the project shall use the Smart Document Understanding feature of Watson Discovery to train it on what text in the owner's manual is important and what is not. This will improve the answers returned from the queries.

2. LITERATURE SURVEY:-

2.1 EXISTING PROBLEM :

The typical customer care chat bot can answer simple questions, such as store locations and hours, directions, and perhaps even making a ppointments. When a question falls outside of the scope of the per-determined question set, the option is typically to tell the customer the question is not valid or offer to speak to a real person.

2.2 PROPOSED SOLUTION :

Steps:

1. The document is annotated using Watson Discovery SDU
2. The user interacts with the backend server via the app UI. The front end app UI is a chat bot that engages the user in a conversation.
3. Dialog between the user and backend server is coordinated using a Watson Assistant dialog skill.
4. If the user asks a product operation question, a search query is passed to a predefined IBM Cloud Functions action.
5. The Cloud Functions action will query the Watson Discovery service and return the results.

1. Create IBM Cloud Services

Create the following services:

a. WatsonDiscovery

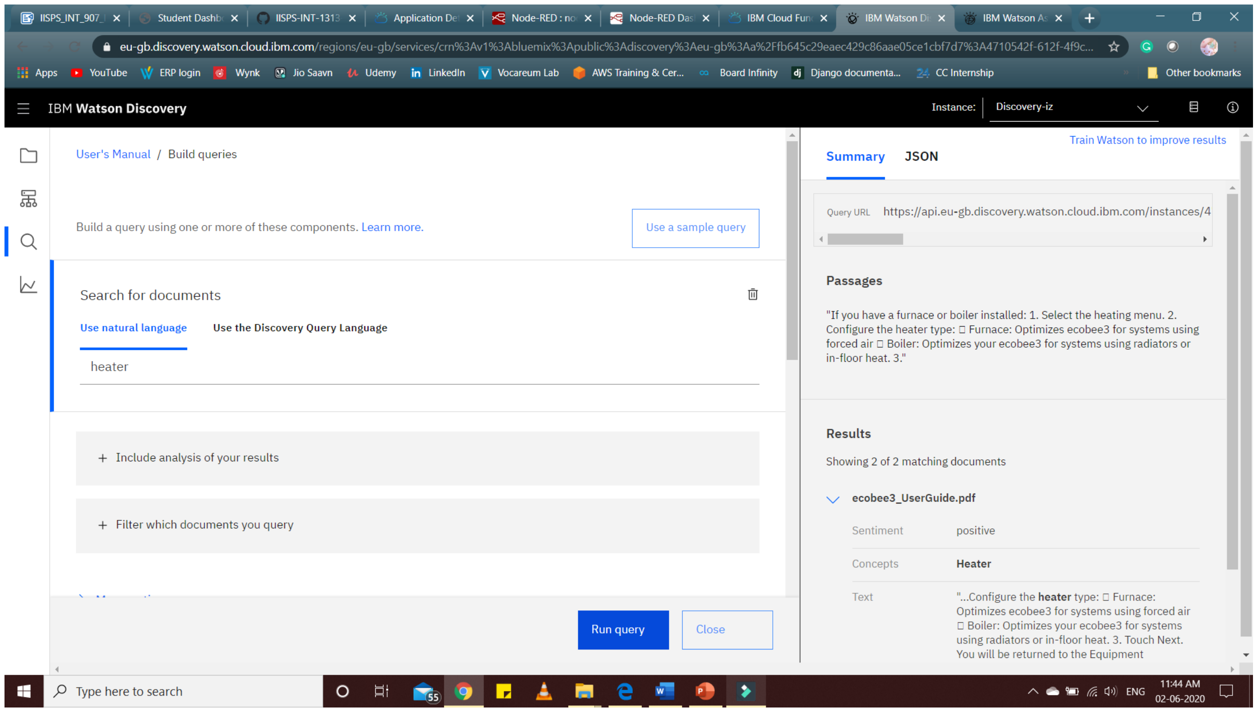
b. WatsonAssistant

c. NodeRed

2. Configure Watson Discovery

Import the document

Launch the Watson Discovery tool and create a new data collection by selecting the Upload your own data option. Give the data collection a unique name. When prompted, select and upload the ecobee3_UserGuide.pdf file located in the data directory of your local repo.


IBM Watson Discovery
Instance: Discovery-iz
User's Manual / Build queries
Use a sample query
Summary
JSON
Train Watson to improve results
Search for documents
Use natural language
Use the Discovery Query Language
Include analysis of your results
Filter which documents you query
Run query
Close
Type here to search

Build a query using one or more of these components. Learn more.

Search for documents: heater

Query URL https://api.eu-gb.discovery.watson.cloud.ibm.com/instances/4

Passages

"If you have a furnace or boiler installed: 1. Select the heating menu. 2. Configure the heater type: □ Furnace: Optimizes ecobee3 for systems using forced air □ Boiler: Optimizes your ecobee3 for systems using radiators or in-floor heat. 3."

Results

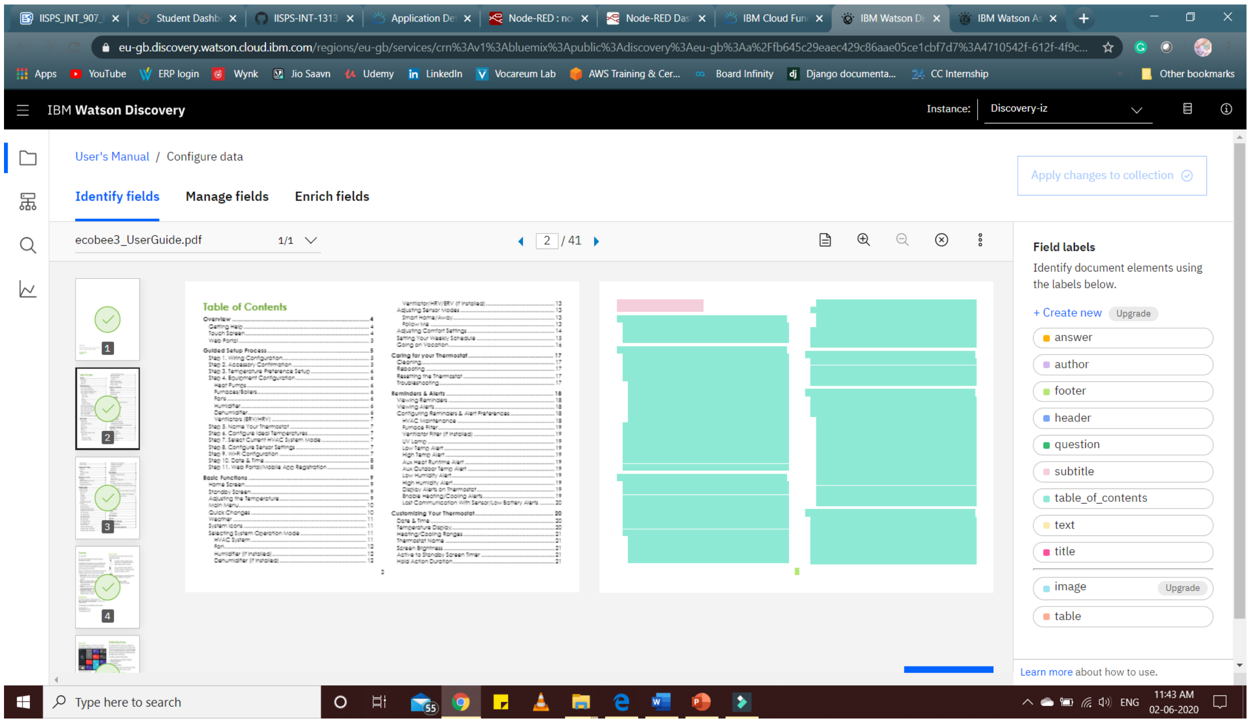
Showing 2 of 2 matching documents

ecobee3_UserGuide.pdf

Sentiment	positive
Concepts	**Heater**
Text	"...Configure the **heater** type: □ Furnace: Optimizes ecobee3 for systems using forced air □ Boiler: Optimizes your ecobee3 for systems using radiators or in-floor heat. 3. Touch Next. You will be returned to the Equipment

Annotate with SDU

Now let's apply SDU to our document to see if we can generate some better query responses. From the Discovery collection panel, click the Configure data button (located in the top right corner) to start the SDU process. The goal is to annotate all of the pages in the document so Discovery can learn what text is important, and what text can be ignored.



Identify document elements using the labels below.

Learn more about how to use.

3. Create IBM Cloud Function

Now let's create the web action that will make queries against our Discovery collection. Start the IBM Cloud Functions service by selecting Create Resource from the IBM Cloud dashboard. Enter functions as the filter, then select the Functions card:

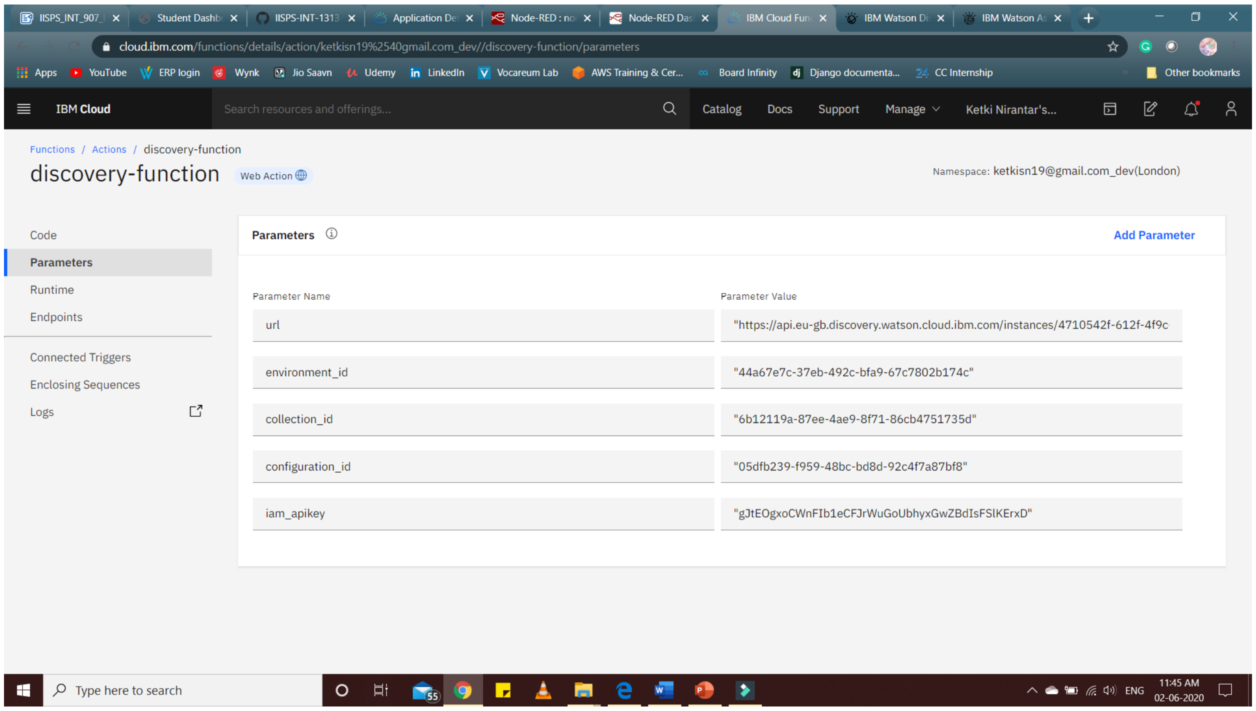
From the Functions main panel, click on the Actions tab. Then click on Create. From the Create panel, select the Create Action option.
On the Create Action panel, provide a unique Action Name, keep the default package and select the Node.js 10 runtime.
Click the Create button to create the action.
Once your action is created, click on the Code tab:

In the code editor window, cut and paste in the code from the disco-action.js file found in the action's directory of your local repository. The code is pretty straight-forward - it simply connects to the Discovery service, makes a query against the collection, then returns the response.

If you press the Invoke button, it will fail due to credentials not being defined yet. We'll do this next.Select the Parameters tab:

Add the following keys:

- url
- environment_id
- collection_id
- iam_apikey
- configuration_id



Parameter Name	Parameter Value
url	"https://api.eu-gb.discovery.watson.cloud.ibm.com/instances/4710542f-612f-4f9c
environment_id	"44a67e7c-37eb-492c-bfa9-67c7802b174c"
collection_id	"6b12119a-87ee-4ae9-8f71-86cb4751735d"
configuration_id	"05dfb239-f959-48bc-bd8d-92c4f7a87bf8"
iam_apikey	"gJtEOgxoCWnFIb1eCFJrWuGoUbhyxGwZBdIsFSlKErxD"

For values, please use the values associated with the Discovery service you created in the previous step.Now that the credentials are set, return to the Code panel and press the Invoke button again. Now you should see actual results returned from the Discovery Service.
Next, go to the Endpoints panel.
Click the checkbox for Enable as Web Action. This will generate a public endpoint URL.
Take note of the URL value, as this will be needed by Watson Assistant in a future step.
To verify you have entered the correct Discovery parameters, execute the provided curl command. If it fails, re-check your parameter values.

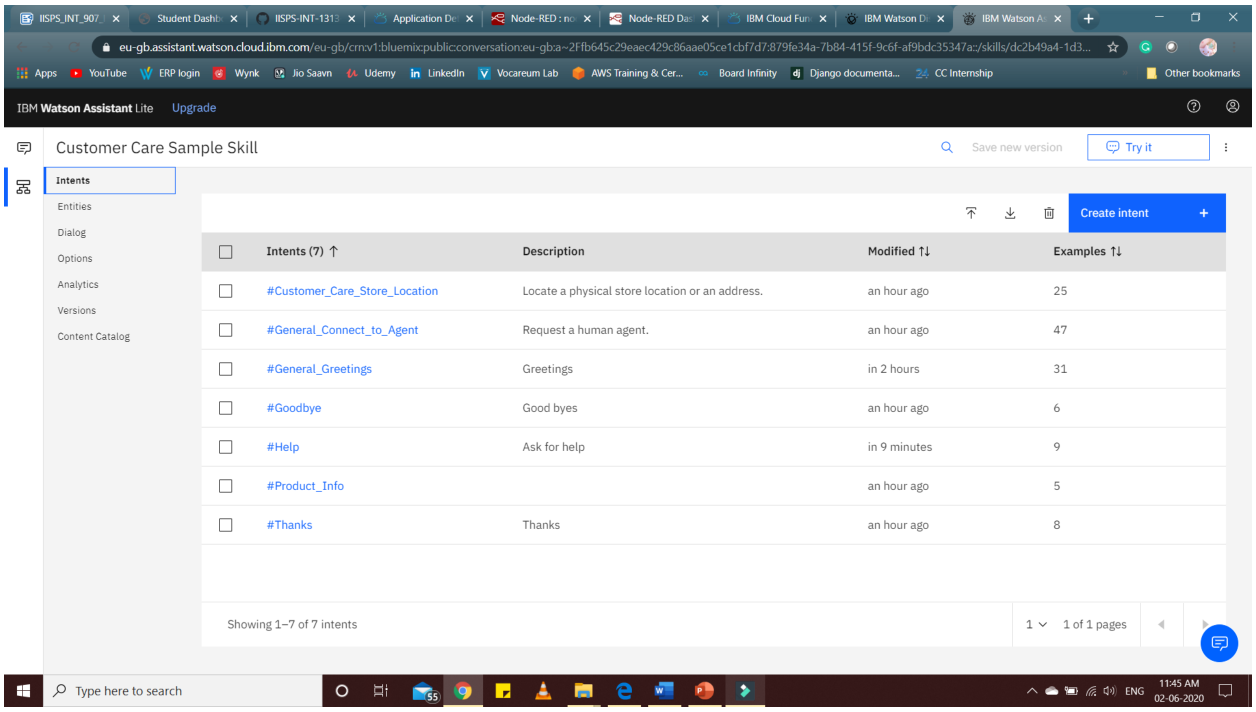
4. Configure Watson Assistant

Launch the Watson Assistant tool and create a new dialog skill. Select the Use sample skill option as your starting point. This dialog skill contains all of the nodes needed to have a typical call center conversation with a user.

Add new intent

The default customer care dialog does not have a way to deal with any questions involving outside resources, so we will need to add this. Create a new intent that can detect when the user is asking about operating the Product. From the Customer Care Sample Skill panel, select the Intents tab.

Click the Create intent button.Name the intent #Product_Info, and at a minimum, enter the following example questions to be associated with it.



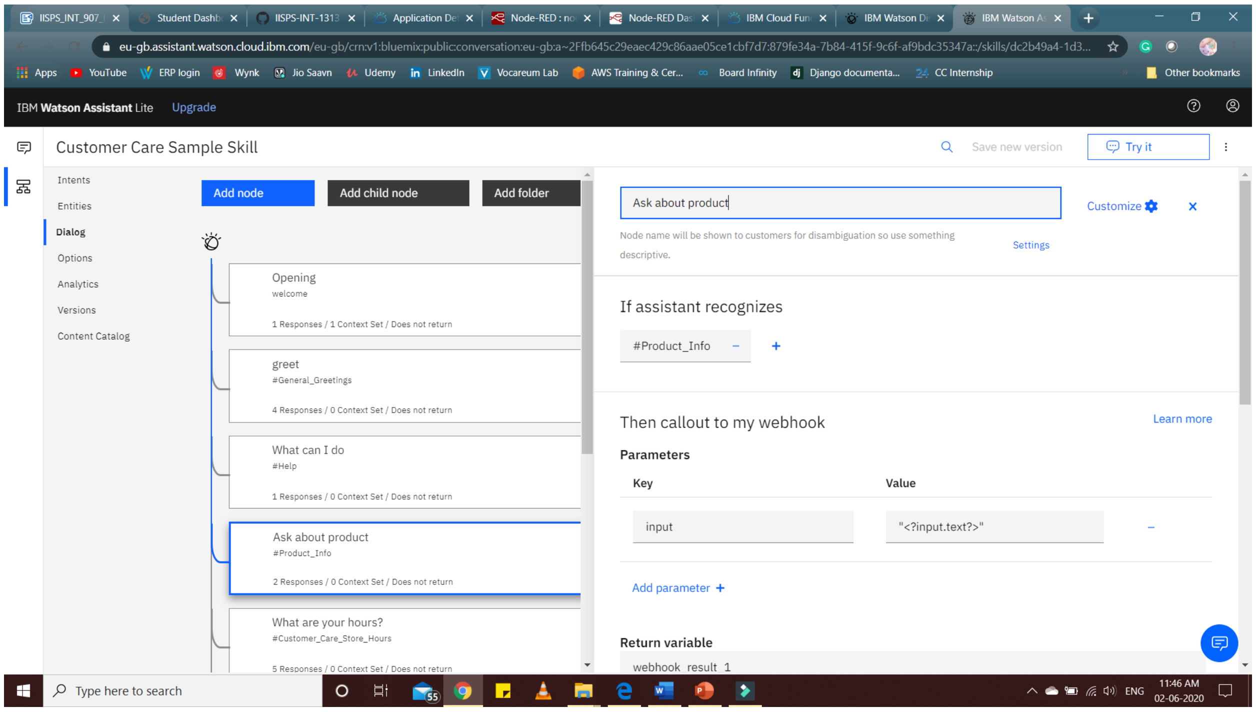
	Intents (7)	Description	Modified	Examples
☐	#Customer_Care_Store_Location	Locate a physical store location or an address.	an hour ago	25
☐	#General_Connect_to_Agent	Request a human agent.	an hour ago	47
☐	#General_Greetings	Greetings	in 2 hours	31
☐	#Goodbye	Good byes	an hour ago	6
☐	#Help	Ask for help	in 9 minutes	9
☐	#Product_Info		an hour ago	5
☐	#Thanks	Thanks	an hour ago	8

Showing 1–7 of 7 intents   1   1 of 1 pages

Create new dialog node

Now we need to add a node to handle our intent. Click on the Dialog tab, then click on the drop-down menu for the Small Talk node, and select the Add node below option.

Name the node "Ask about product" and assign it our new intent. This means that if Watson Assistant recognizes a user input such as "how do I set the time?", it will direct the conversation to this node.


IBM Watson Assistant Lite
Upgrade
Customer Care Sample Skill
Save new version
Try it
Intents
Entities
Dialog
Options
Analytics
Versions
Content Catalog
Add node
Add child node
Add folder
Opening
welcome
1 Responses / 1 Context Set / Does not return
greet
#General_Greetings
4 Responses / 0 Context Set / Does not return
What can I do
#Help
1 Responses / 0 Context Set / Does not return
Ask about product
#Product_Info
2 Responses / 0 Context Set / Does not return
What are your hours?
#Customer_Care_Store_Hours
5 Responses / 0 Context Set / Does not return
Customize
Settings
Learn more
Add parameter

Ask about product

Node name will be shown to customers for disambiguation so use something descriptive.

If assistant recognizes

#Product_Info

Then callout to my webhook

Parameters

Key	Value
input	"<?input.text?>"

Return variable

webhook_result_1

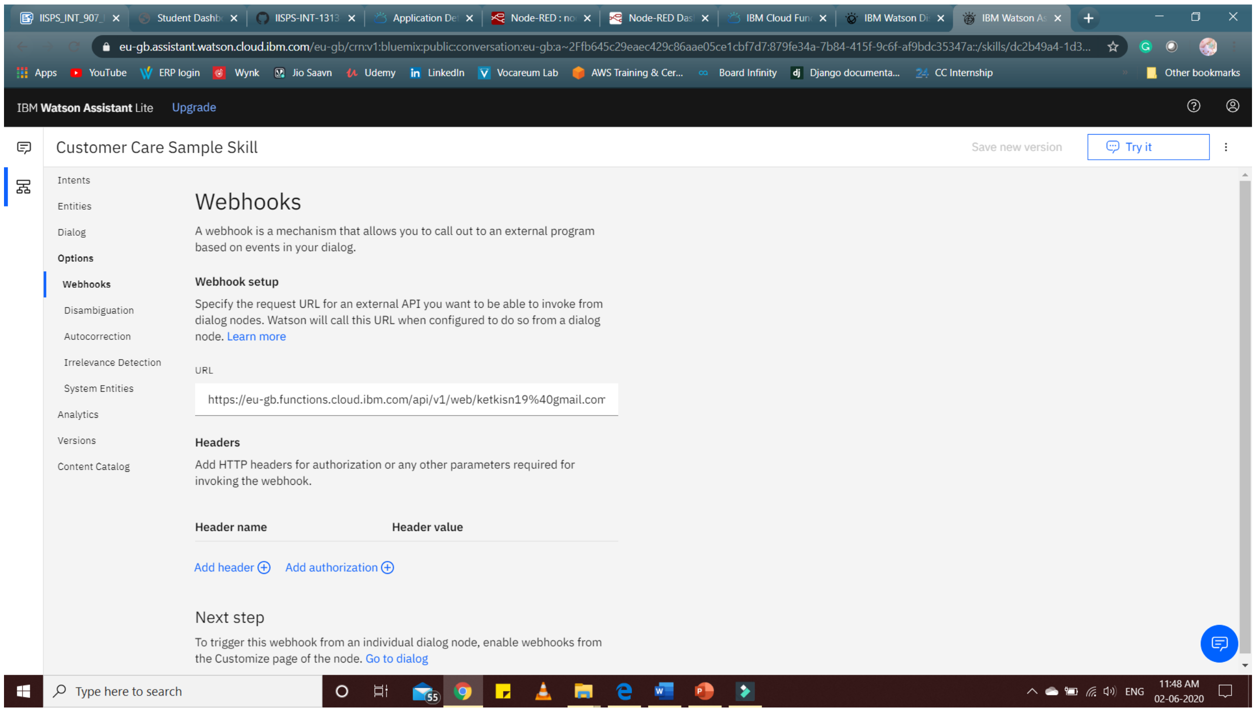
Enable webhook from Assistant

Set up access to our Webhook for the IBM Cloud Functions action you created in

Select the Options tab:

Enter the public URL endpoint for your action. Return to the Dialog tab, and click on the Askabout product node. From the details panel for the node, click on Customize, and enable Webhooks for this node: Click Apply.

The dialog node should have a Return variable set automatically to $webhook_result_1. This is the variable name you can use to access the result from the Discovery service query.



Webhooks

A webhook is a mechanism that allows you to call out to an external program based on events in your dialog.

Webhook setup

Specify the request URL for an external API you want to be able to invoke from dialog nodes. Watson will call this URL when configured to do so from a dialog node. Learn more

URL

https://eu-gb.functions.cloud.ibm.com/api/v1/web/ketkisn19%40gmail.com

Headers

Add HTTP headers for authorization or any other parameters required for invoking the webhook.

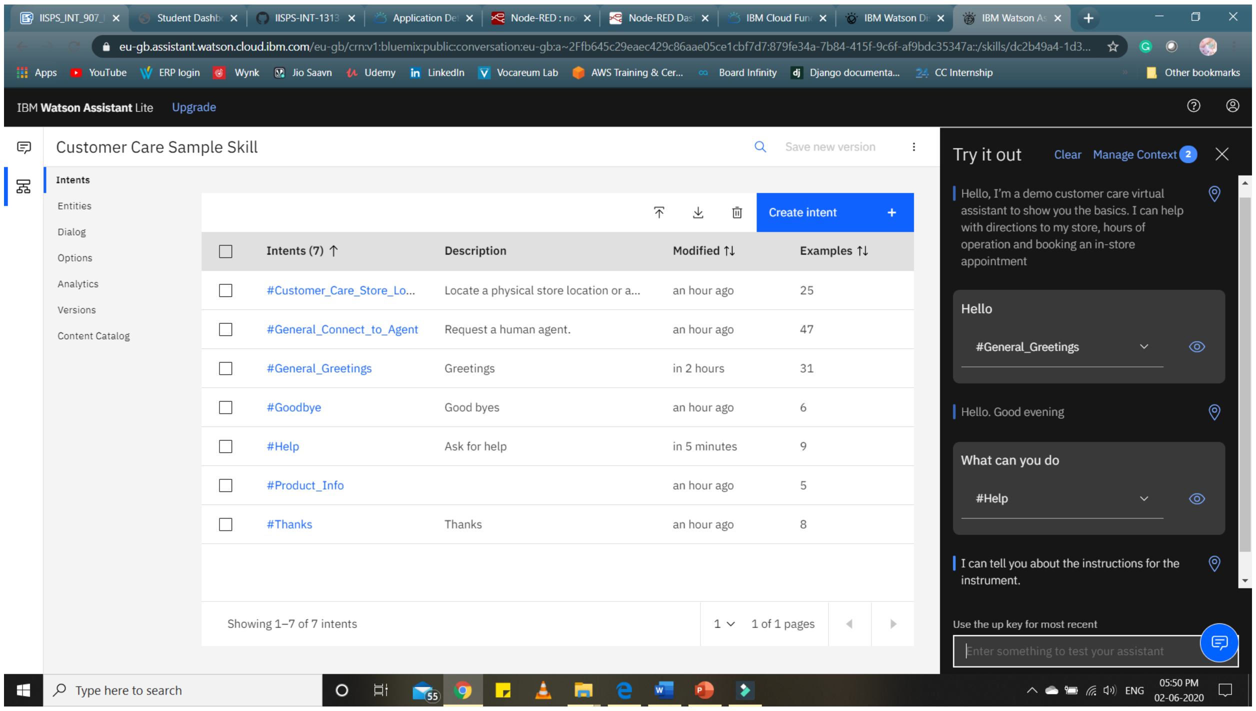
Header name	Header value

Next step

To trigger this webhook from an individual dialog node, enable webhooks from the Customize page of the node. Go to dialog

Test in Assistant Tooling

From the Dialog panel, click the Try it button located at the top right side of the panel.Enter some user input: Note that the input "how do I turn on the heater?" has triggered our Ask about product dialog node, which is indicated by the #Product_Info response. And because we specified that $webhook_result_1.passages be the response, that value is displayed also.You can also verify that the call was successfully completed by clicking on the Manage Context button at the top right. The response from the Discovery query will be stored in the$webhook_result_1 variable.


IBM **Watson Assistant** Lite Upgrade

Customer Care Sample Skill

Intents (7)	Description	Modified	Examples
#Customer_Care_Store_Lo...	Locate a physical store location or a...	an hour ago	25
#General_Connect_to_Agent	Request a human agent.	an hour ago	47
#General_Greetings	Greetings	in 2 hours	31
#Goodbye	Good byes	an hour ago	6
#Help	Ask for help	in 5 minutes	9
#Product_Info		an hour ago	5
#Thanks	Thanks	an hour ago	8

Showing 1–7 of 7 intents

Try it out

Hello, I'm a demo customer care virtual assistant to show you the basics. I can help with directions to my store, hours of operation and booking an in-store appointment

Hello

#General_Greetings

Hello. Good evening

What can you do

#Help

I can tell you about the instructions for the instrument.

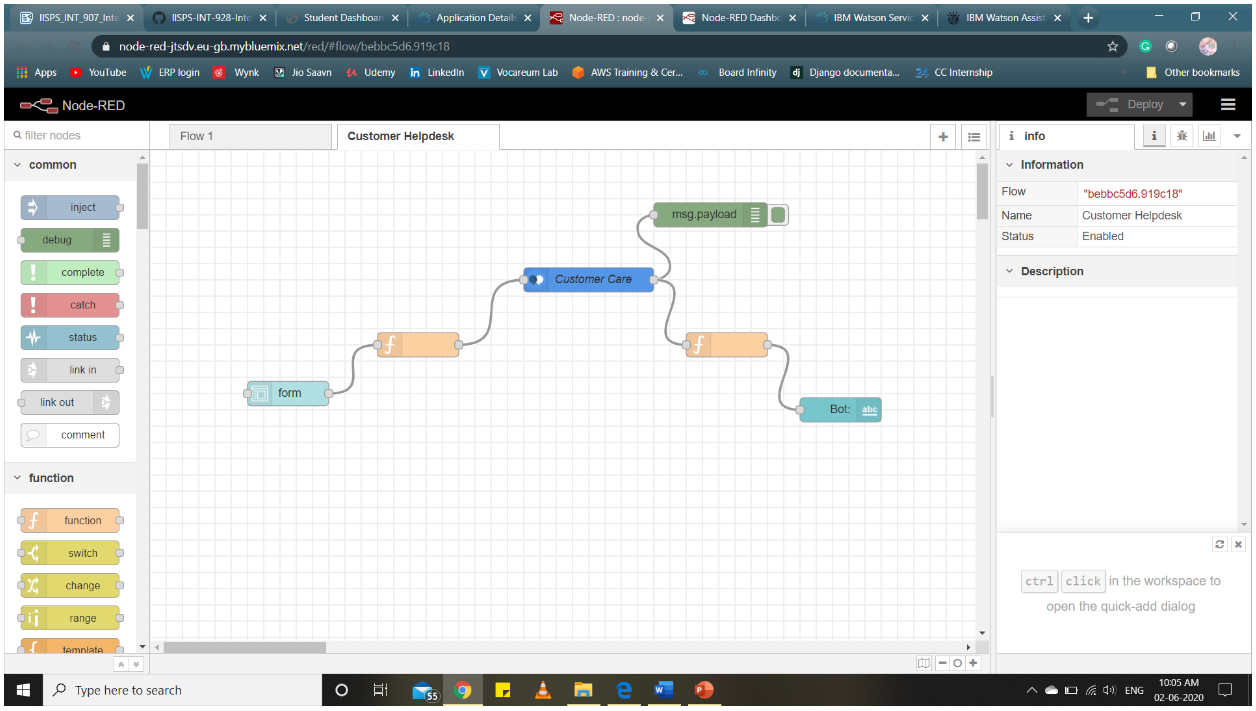
Use the up key for most recent

5. Create flow and configurenode:

At first go to manage palette and install dashboard.

Now, Create the flow with the help of following node:

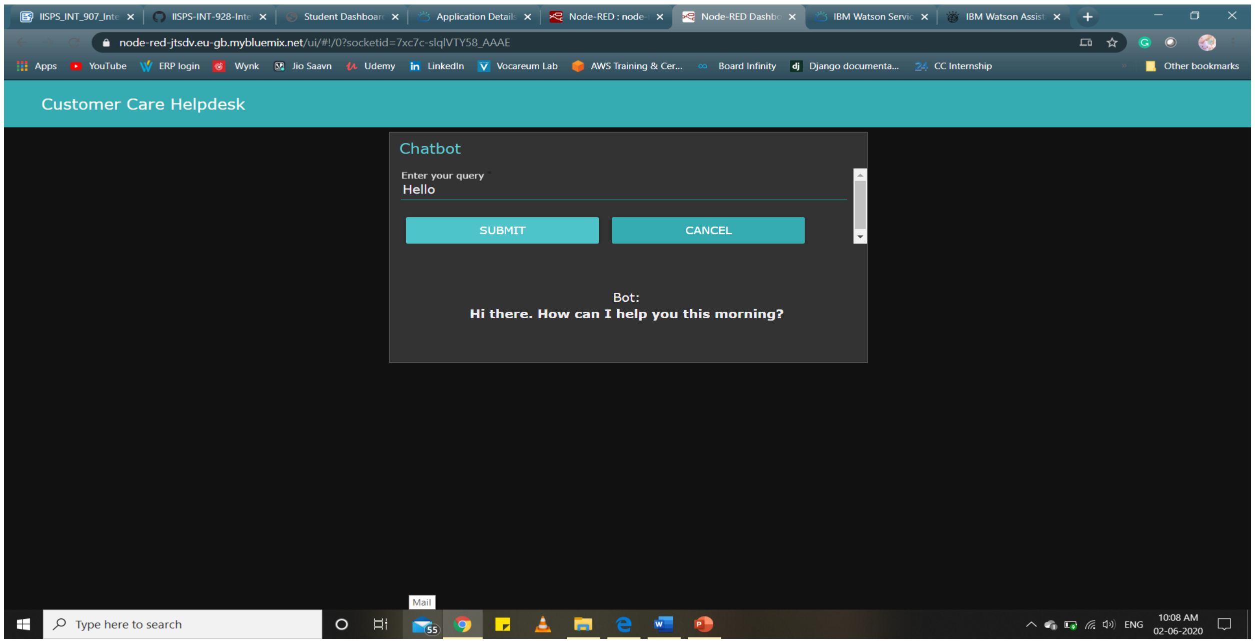
1. Inject
2. Assistant
3. Debug
4. Function
5. Ui_Form
6. Ui_Text



Flow	"bebbc5d6.919c18"
Name	Customer Helpdesk
Status	Enabled

6. Deploy and run Node Red app.

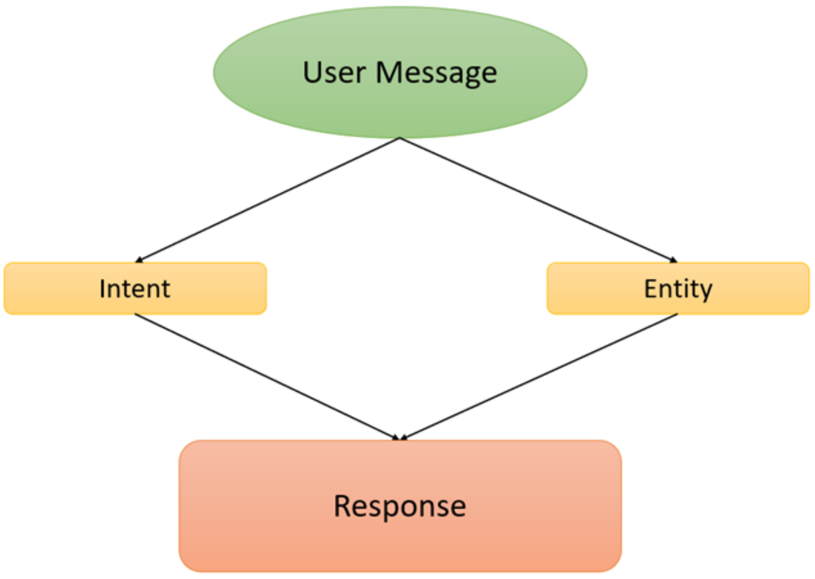
Deploy the Node Red flow.
Then copy the link url upto .net/ and paste at anew tab by ui at the end of the url, like this,
https://node-red-jtsdv.eu-gb.mybluemix.net/ui/


node-red-jtsdv.eu-gb.mybluemix.net/ui/#!/0?socketid=7xc7c-slqlVTY58_AAAE
Customer Care Helpdesk
Chatbot
Enter your query
Hello
SUBMIT
CANCEL

Bot:
Hi there. How can I help you this morning?

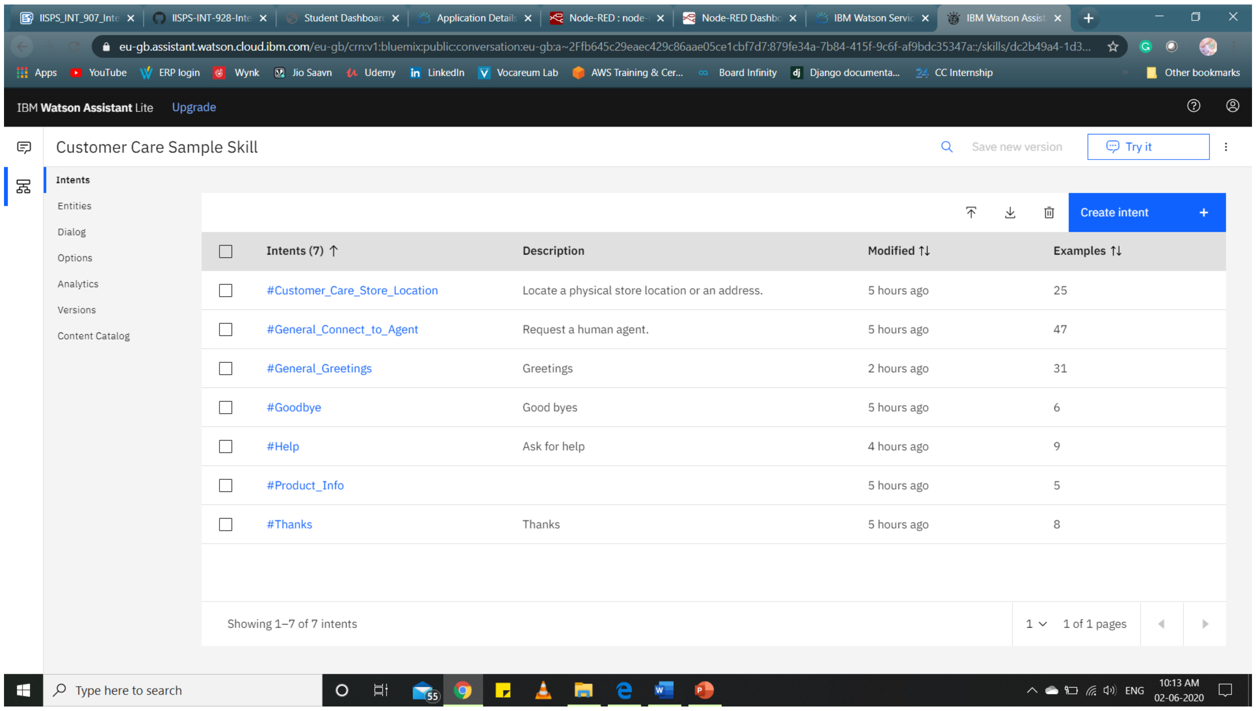
3 .THEORITICAL ANALYSIS

3.1 Block diagram



4. EXPERIMENTAL INVESTIGATIONS

- Watson Assistant

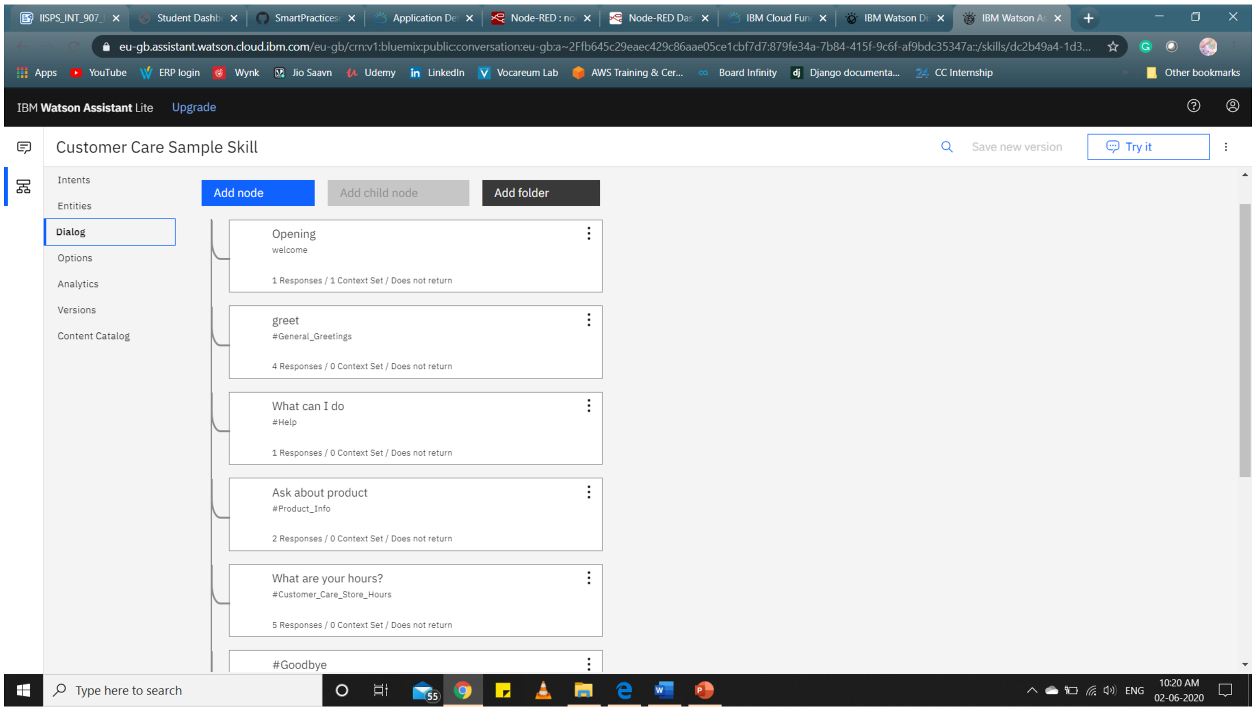


IBM **Watson Assistant** Lite Upgrade

Customer Care Sample Skill

Intents (7)	Description	Modified	Examples
#Customer_Care_Store_Location	Locate a physical store location or an address.	5 hours ago	25
#General_Connect_to_Agent	Request a human agent.	5 hours ago	47
#General_Greetings	Greetings	2 hours ago	31
#Goodbye	Good byes	5 hours ago	6
#Help	Ask for help	4 hours ago	9
#Product_Info		5 hours ago	5
#Thanks	Thanks	5 hours ago	8

Showing 1–7 of 7 intents 1 of 1 pages



IBM **Watson Assistant** Lite Upgrade

Customer Care Sample Skill

Opening
welcome
1 Responses / 1 Context Set / Does not return

greet
#General_Greetings
4 Responses / 0 Context Set / Does not return

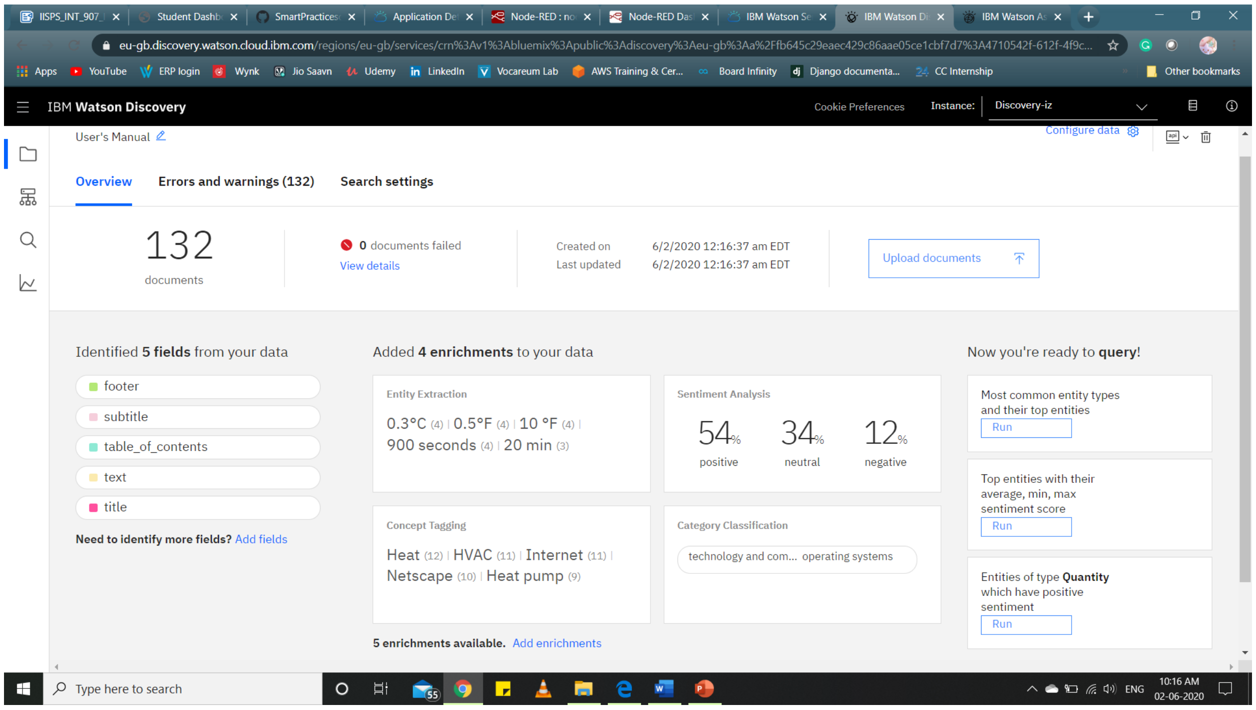
What can I do
#Help
1 Responses / 0 Context Set / Does not return

Ask about product
#Product_Info
2 Responses / 0 Context Set / Does not return

What are your hours?
#Customer_Care_Store_Hours
5 Responses / 0 Context Set / Does not return

#Goodbye

- Watson Discovery



IBM Watson Discovery

User's Manual

Overview | Errors and warnings (132) | Search settings

132 documents

0 documents failed
View details

Created on 6/2/2020 12:16:37 am EDT
Last updated 6/2/2020 12:16:37 am EDT

Upload documents

Identified **5 fields** from your data

- footer
- subtitle
- table_of_contents
- text
- title

Need to identify more fields? Add fields

Added **4 enrichments** to your data

Entity Extraction
0.3°C (4) | 0.5°F (4) | 10 °F (4) | 900 seconds (4) | 20 min (3)

Sentiment Analysis
54% positive
34% neutral
12% negative

Concept Tagging
Heat (12) | HVAC (11) | Internet (11) | Netscape (10) | Heat pump (9)

Category Classification
technology and com... operating systems

5 enrichments available. Add enrichments

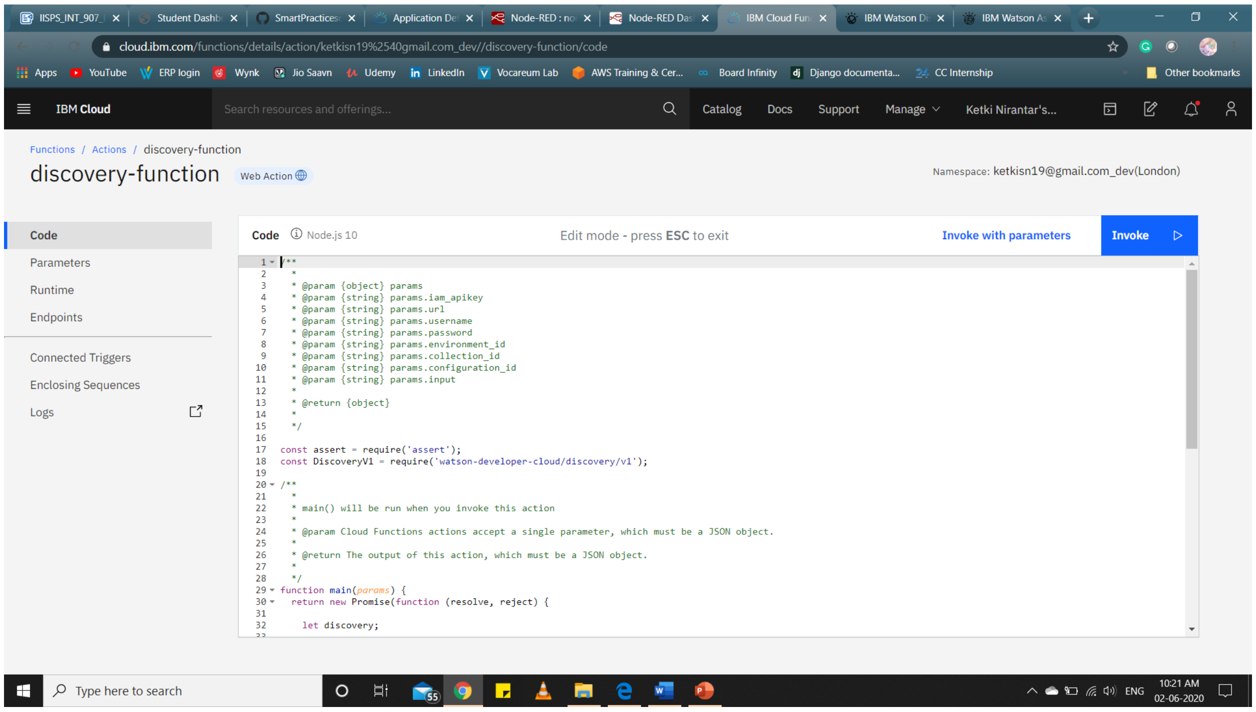
Now you're ready to **query**!

Most common entity types and their top entities — Run

Top entities with their average, min, max sentiment score — Run

Entities of type **Quantity** which have positive sentiment — Run

- Cloud Function



IBM Cloud

Functions / Actions / discovery-function

discovery-function Web Action

Namespace: ketkisn19@gmail.com_dev(London)

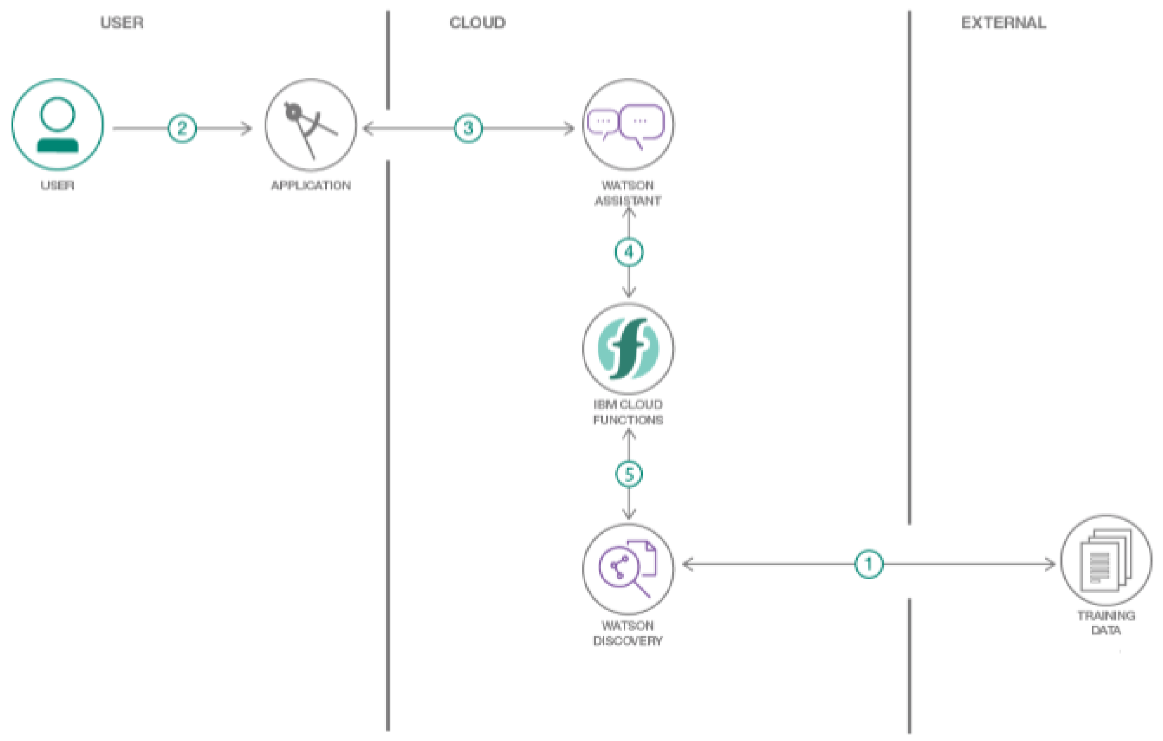
Code | Parameters | Runtime | Endpoints | Connected Triggers | Enclosing Sequences | Logs

Code Node.js 10 Edit mode - press **ESC** to exit Invoke with parameters Invoke

```
/**
  *
  * @param {object} params
  * @param {string} params.iam_apikey
  * @param {string} params.url
  * @param {string} params.username
  * @param {string} params.password
  * @param {string} params.environment_id
  * @param {string} params.collection_id
  * @param {string} params.configuration_id
  * @param {string} params.input
  *
  * @return {object}
  *
  */

const assert = require('assert');
const DiscoveryV1 = require('watson-developer-cloud/discovery/v1');

/**
  *
  * main() will be run when you invoke this action
  *
  * @param Cloud Functions actions accept a single parameter, which must be a JSON object.
  *
  * @return The output of this action, which must be a JSON object.
  *
  */
function main(params) {
  return new Promise(function (resolve, reject) {

    let discovery;
```

5. FLOWCHART

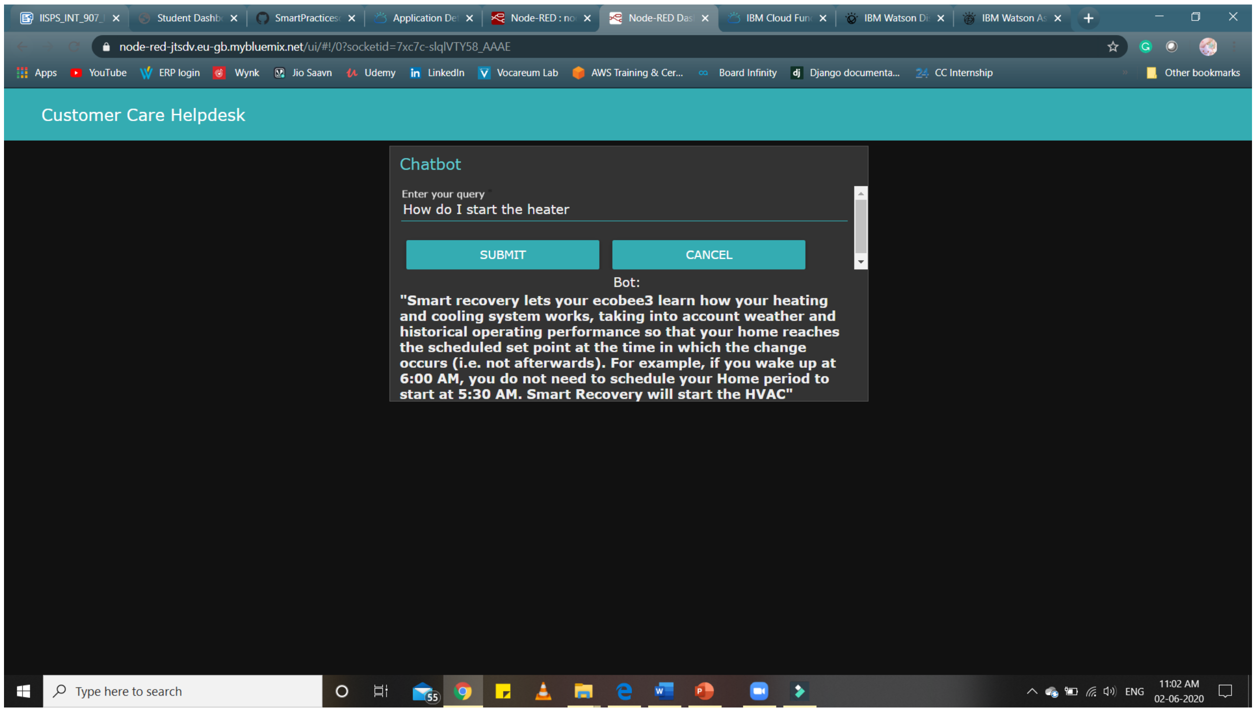
This is the flow how we are going to do the tasks for the proposed problems



1. The document is annotated using Watson Discovery SDU
2. The user interacts with the backend server via the app UI. The frontend app UI is a chatbot that engages the user in aconversation.
3. Dialog between the user and backend server is coordinated using a Watson Assistant dialogskill.
4. If the user asks a product operation question, a search query is passed to a predefined IBM Cloud Functions action.
5. The Cloud Functions action will query the Watson Discovery service and return the results.

6. RESULTS

The chatbot was successfully made using Watson assistant and using SDU. All the services were integrated using Node Red Application.


node-red-jtsdv.eu-gb.mybluemix.net/ui/#!/0?socketid=7xc7c-slqlVTY58_AAAE
Customer Care Helpdesk
Chatbot
SUBMIT
CANCEL

Enter your query
How do I start the heater

Bot:
"Smart recovery lets your ecobee3 learn how your heating and cooling system works, taking into account weather and historical operating performance so that your home reaches the scheduled set point at the time in which the change occurs (i.e. not afterwards). For example, if you wake up at 6:00 AM, you do not need to schedule your Home period to start at 5:30 AM. Smart Recovery will start the HVAC"

7. ADVANTAGES & DISADVANTAGES

Advantages:

A. Reduced costs: Chatbots eliminate the need for labor during online interaction with customers. This is obviously a great advantage for companies that receive multiple queries at once. In addition to saving costs with them, companies can align the chatbot with their objectives, and use them as a means to enhance customer conversion.

B. 24/7 Availability: Unlike humans, once we install a chatbot, it can handle queries at any time of day. Thus, the customer does not have to wait for a commercial of the company to help him. This also allows companies to monitor customer « traffic » duringnon-working hours and contact them later.

C. Learning and updating: AI-based chatbots are able to learn from interactions and update independently. This is one of the main advantages. When you hire a new employee, you have to train them continuously. However, chatbots « form » themselves (with certain limitations, of course).

D. Management of multiple clients: Humans can serve a limited number of customers at the same time. This restriction does not exist for chatbots, and they can manage all the necessary queries simultaneously. This is one of the main advantages of using chatbot, as no customer is left unattended and youare solving different problems at the same time. There are chatbots companies already working on developing voice chatbot services.

Disadvantages:

A. Complex interface: It is often considered that chatbots are complicated and need a lot of time to understand what you want in customer. Sometimes, it can also annoy the client about their slowness, or their difficulty in filtering responses. They don't get you right: Fixed chatbots can get stuck easily. If a query doesn't relate to something you've previously « taught » it, you won't understand it. This can lead to a frustrated customer and the loss of the sale. Other times they do understand you, but they need double (or triple) as many messages as one person, which spoils the user experience.

B. Bad memory: The chatbots are not able to memorize a conversation already had, which forces the user to write the same thing over and over again. This can be cumbersome for the client and annoying for the effort required. Therefore, it is important to be careful when designing chatbots and make sure that the program is able to understand users' queries and respond accordingly

8.APPLICATIONS

Some applications can be: -

1. Help User: This chatbot will be useful for the user to ask the assistant the queries related to the Product and will give them clear guidance about the Product. If the Assistant doesn't know about a certain query, it will redirect to the correct person for it.
2. Content delivery: Media Publishers have realized that chatbots are a powerful way to engage with theiraudiences and monitor engagement to gain valuable insights on reader interests. Chat with the CNN and Wall Street Journal Chatbots on Facebook Messenger and receive the latest news directly in Messenger, without having to visit their websites.
3. Companionship: The primary function of the chatbot is to be a virtual companion – To speak with senior people on general topics like the weather, nature, hobbies, movies, music, news, etc. The chatbot asks questions, reacts to the answers, is able to speak on various topics, and share interesting news and facts from Google.

9. CONCLUSION

This chatbot will be useful for the user to ask the assistant the queries related to the Product and will give them clear guidance about the product. If the Assistant doesn't know about a certain query, it will redirect to the correct person for it. Chatbots are quickly making transformational changes and allowing businesses to thrive through customer interactions. The feedback and survey through chatbots strengthen the position of businesses as they analyze the reason behind different levels of customer approval. Use of conversational AI chatbots only means better engagement and relentless need for customer satisfaction in the near future.

10. FUTURE SCOPE

Future Scope of this chatbot can be by adding the following to make it more advance: -

1. Smarter Virtual Assistants: Much of what virtual assistants do now are basic skills, such as retrieving data and basic computation. As natural language processing (NLP) continues to mature, virtual assistants will improve their comprehension and response capabilities, allowing for their use to become more widespread and complex. Also, as machine learning progresses, we may see virtual assistants become smarter and begin to learn and predict customer needs.
2. Integration with IoT Devices: Car speakers, smart home devices, and wearables are just a few examples where the virtual assistant is departing from its original hardware and making its way to in-context devices. These integrations ensure that virtual assistants can always be near their human and ready to support any need. It is expected that these integrations will continue at an accelerated pace throughout 2018.
3. Voice-control: Voice recognition can be added with the virtual assistant. Then the customer can control application by using his voice. Soon, we could be joining meetings with a voice command, instead of dialing in the long meeting ID and password.

11. BIBILOGRAPH

1. https://www.ibm.com/cloud/architecture/tutorials/cognitive_discovery
2. https://cloud.ibm.com/docs/assistant?topic=assistant-getting-started
3. https://developer.ibm.com/recipes/tutorials/how-to-create-a-watson-chatbot-on-nodered/
4. https://github.com/IBM/watson-discovery-sdu-with-assistant
5. https://www.youtube.com/watch?v=em_pgZ4tZrM

Project Demo Link: https://youtu.be/-_JDEFqL2kY
Node Red UI Link: https://node-red-jtsdv.eu-gb.mybluemix.net/ui/